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*Acanthopsolus Lageniformis*, N. Sp.,

A TREMATODE IN THE CATFISH.

BY

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*From the Northumberland Sea Fisheries Report for 1909.*



*ACANTHOPSOLUS LAGENIFORMIS*, N. Sp.,  
A TREMATODE IN THE CATFISH.

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The following work was done entirely at the Dove Marine Laboratory, Cullercoats, from material brought in by the fishing boats.

*Distomum*, sp., Lebour, "Fish Trematodes of the Northumberland Coast," Northumberland Sea Fisheries Report for 1907, p. 31, Plate III., figs. 6—8.

A brief and incomplete description of this Trematode was given by myself in the above-mentioned paper. Nicoll (1) is of the opinion that it is closely allied to *Acanthopsolus* Odhner (2) and the differences are so slight that it seems hardly justifiable to found a new genus for it.

The worm occurs frequently, and in great numbers in the upper part of the intestine of the Catfish *Anarrhichas lupus*. It is by no means always present, but occurs in about 40 per cent. of the local Catfish in Spring, Summer, and early Autumn, *i.e.*, from April till October, being rarer in Spring than in Summer, and disappearing in the Winter altogether, repeated search for it in the Winter months being unsuccessful. Two Catfish from Shetland brought in by the North Shields boats (April, 1909) both also contained the worm. The usual habitat is the creamy, opaque, and very thick intestinal slime just beyond the stomach. The worm gets entangled in this, and it is very difficult to get it completely away from the slime which must act as an effective obstacle to its being swept away with the intestinal contents of its host, the suckers being apparently too weak to make any hold on the walls of the intestine. The stomach is sometimes also infected as well as the mouth and pharynx, but usually the younger stages occur in these latter regions, and the anterior portion of the intestines seems to be the true habitat. There may be hundreds present in one fish, and there is always a great number if the worm occurs at all.

This Trematode is very small and inconspicuous, and with the exception of the eggs is quite colourless. The adult (Plate I., figs. 1—2) measures 0.54 mm. to 1.30 mm. in length, and is flask-shaped, the broadest part which is about half the length occurring behind the ventral sucker. The anterior end narrows considerably, and after a short neck the body gradually broadens out, and is rounded posteriorly. In section it is nearly round, but slightly flattened dorso-ventrally, especially in front of the ventral sucker. The exceptionally large eggs have thick yellow shells which shine conspicuously through the colourless body. The whole worm is covered with sharp spines arranged in rows, somewhat flat and scale like in front, and becoming very sharp from the neck to about the posterior third of the body where they dwindle in size, although they never entirely disappear even at the extreme end.

On the dorsal surface are two conspicuous eye-spots, one on each side of the pharynx, each composed of a dark brown central mass of pigment with smaller flecks radiating irregularly from it. These appear to be nearer or further from the oral sucker according to the amount of extension or retraction of the extremely mobile neck.

The suckers are weakly developed and very nearly equal in size, the oral sucker in the adult being slightly the larger. In preserved material a specimen 0.35 mm. in length has the oral sucker globular and 0.06 mm. across, or it may be oval or oblong measuring 0.07 mm. by 0.05 mm. in a specimen of the same size, and 0.09 mm. by 0.08 mm. in a specimen 0.54 mm. long. It grows with the worm. The aperture is almost terminal with a slight ventral inclination. The ventral sucker occurs just in front of the centre of the body, and is inconspicuous, and not so muscular as the oral sucker. It measures 0.06 mm. across in all the specimens examined, and does not appear to increase in size from the full-grown cercaria stage to the adult.

The oral sucker leads to a narrow prepharynx so extremely contractile that it sometimes appears not to exist at all, its walls being flatly spread over the anterior part of the pharynx which telescopes into it, or it may reach a length of more than 0.08 mm., and then is seen to be narrow and thin-walled. Following this is a strongly muscular pharynx 0.07 mm. long and about two-thirds as broad. This leads to a very short and broad œsophagus which branches immediately in front of the ventral sucker into two broad intestinal cœca reaching nearly to the posterior end of the body.

(In the previous description the cœca were described as not reaching so far). Between the termination of the cœca is a pear-shaped excretory vesicle reaching nearly to the level of the hind end of the testes and opening posteriorly and slightly dorsally.

The genital opening is a transverse slit situated in the middle line immediately in front of the ventral sucker. At times it is very difficult to see, but usually in the living worm it can easily be made out as it is constantly opening and shutting. This leads to a small genital sinus, into which open the male and female ducts, male on the right and female on the left. The testes are longitudinally oval bodies, 0.08 mm. in length and 0.05 mm. broad, occurring ventrally to the intestinal lobes and a little nearer the posterior end of the body than the ventral sucker. They are symmetrically placed one on each side of the body. From each testis runs a narrow vas deferens, and these join the vesicula seminalis behind the ventral sucker. The vesicula seminalis is divided into two nearly equal parts by a constriction, and lies completely within the club-shaped cirrus sac. The latter is dorsal to the ventral sucker, in pressure preparations it may be seen either to the right or left side. It contains in front of the vesicula seminalis, a long ductus ejaculatorius, the first part of which is a weakly developed pars prostatica surrounded by gland cells, and the next part is armed for about a quarter of its length with sharp spines with round bases; the terminal part is unarmed and very much curled up. This duct appears to be a protrusible cirrus, although I have not seen it exerted. The ovary is a circular body generally situated immediately in front of the right testis and is slightly smaller than that organ. Dorsally it gives off a long oviduct which makes a twist before giving off a receptaculum seminis and a Laurer's canal. The vitelline duct opens into it just after it gives off the receptaculum seminis. The latter organ when full of sperms is quite conspicuous and of a roundish form. In some specimens it is hardly visible, and the sperms are to be seen moving about in the oviduct and in Laurer's canal. The vitellaria take up almost the whole of the rest of the body, extending dorsally from the extreme posterior end to the level of the centre of the pharynx, only leaving a small median part uncovered. They partly cover the intestinal cœca ventrally. They consist of large lobules indistinctly connected by lateral longitudinal vessels from which a thick transverse branch runs across each side in the region of the ovary to unite in a large receptacle from which a duct enters the oviduct. After receiving

the vitelline duct, the uterus winds in a few loops greatly distended here and there by the enormous eggs and not extending behind the testes. It then runs up straight as a strongly muscular vagina, armed with spines similar to those in the cirrus but rather thinner and not so closely set, to open into the genital sinus.

The eggs, seldom more than four, although eight have been observed, are relatively very large, measuring 0.08 mm. to 0.10 mm. in length, the breadth being about two-thirds of the length. In the smaller specimens the eggs give the worm a most curious appearance, as they are as large as the testes. The smallest specimens (preserved) containing ova measured 0.54 mm. in length. Younger stages from the mouth and stomach of the Catfish measured 0.34 mm. to 0.50 mm. in length, and can be traced from the young stages without vitellaria onwards.

The life history appears to be fairly clear, as a cercaria corresponding in every way to these young stages from the Catfish occurs in the liver of *Buccinum undatum*. This cercaria was first described by myself from Holy Island (3), but further infected specimens of *Buccinum* have been met with about two miles north of Cullercoats Bay, and from these I am able to give an amended description, and can correct certain errors in the first.

80 specimens of *Buccinum undatum* were collected in March, 1910, and in six of these the liver was of an unhealthy brownish colour all over, the reproductive organs in addition being imperfectly developed. The worm occurred throughout the liver which was literally packed with rediæ. I formerly described these rediæ as sporocysts since the small mouth and pharynx with the sac-like intestine, which are undoubtedly present, were not then noticed.

The youngest redia (fig. 3) seen measured 0.30 mm. in length when alive, and was quite colourless. The mouth led to a muscular pharynx and intestine reaching more than half way down the body. The hind end was pointed, and there were no locomotory processes posteriorly which are often so conspicuous in the young redia, and there was no collar anteriorly. It is possible that the absence of these appendages shows that the redia is developed in the same organ as the sporocysts, and that it does not migrate, as is often the case, from one organ to another. This small redia contained no cercariæ. The larger rediæ (figs. 4-5), which measure 0.50 to 3.20 mm. in length, were either very short and sausage-shaped and contained two or more cercariæ, or they were elongated and contained from 16 to 32 cercariæ. These older forms were of a dull



yellowish colour, the enclosed cercariæ being colourless. The intestine of the redia gradually diminishes, and is pushed out of position by the foremost cercaria.

The cercaria (figs. 7-8) may be tailed or tail-less. In the first infected specimens of *Buccinum undatum* examined, all had tails and moved about actively by aid of these, but in the later specimens very few had tails, and these when present seemed to be of little use. Tailed and tail-less forms occur in the same redia. By far the greater number have no tails, and all move by creeping in a leech-like manner by aid of their suckers. It remains to be seen whether a tailed stage precedes the tail-less one in the redia. The tail when present is thin and longer than the body. It is very easily detached. The interesting fact that the tail may be either present or absent shows that it is not a necessary organ, and this is borne out by the supposition that the Catfish eats the *Buccinum*, and the cercaria becomes a mature worm without entering an intermediate host and without a resting stage. We, therefore, see this apparently useless organ disappearing, in some cases entirely.

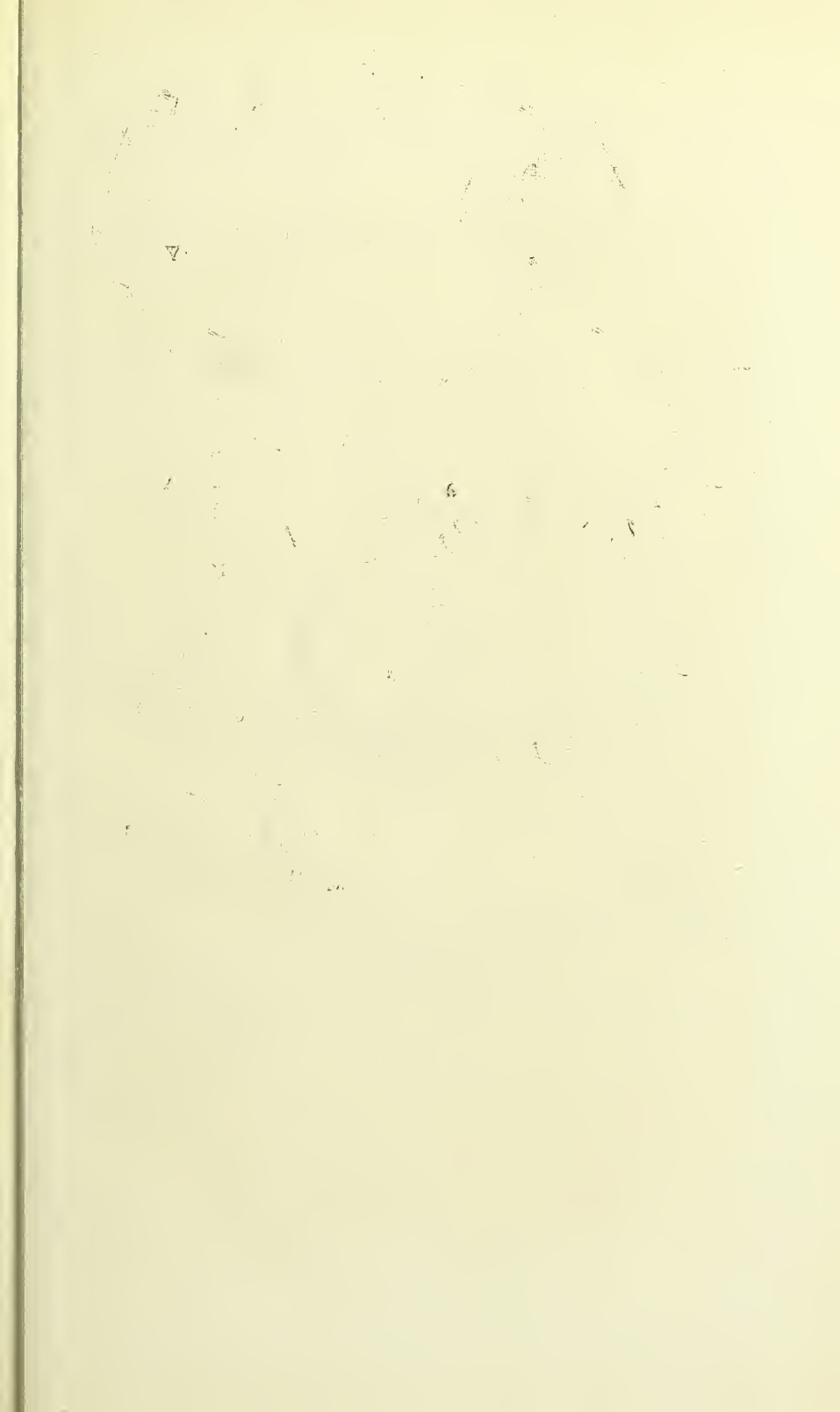
The absence of large glands which are often present in other cercariæ, and serve to secrete the cyst, bears out the theory that the present worm omits the encysted stage. From the number of specimens present in the Catfish, it is extremely likely that the worm enters directly from the *Buccinum*.

The usual length of the cercaria in live pressure preparations is 0.50 mm., in preserved specimens they contract considerably, and measure only about 0.35 mm. The greatest breadth is less than half the length. It is difficult to say what is the shape of the cercaria as it is so contractile that its shape is continually changing. It is certainly never so flask-shaped as the adult worm, and there is not much difference in the shape of the head and tail ends. The body is covered with spines which dwindle posteriorly, but are never absent. The eye-spots are conspicuous. The suckers almost the same size (0.06 mm. across), but the oral may be slightly larger. The prepharynx, pharynx, and intestine agree with those of the adult worm. The excretory vesicle is large, and sometimes appears bilobed. The testes are symmetrically placed, one on each side about midway between the ventral sucker and the posterior end of the body. The ovary may in some specimens be seen in front of the right testis, and there are sometimes traces of the male and female duct. Just behind the oral sucker is a little row of gland cells of a pale yellowish colour.

*Buccinum undatum* is one of the commonest articles of food of the catfish. Remains of it are constantly to be found in the stomach. The specimens examined came from rocky ground where the catfish is to be found living almost entirely on mollusca and where *Buccinum undatum* is one of the commonest forms to be met with. It is, therefore, extremely probable that this cercaria and the adult worm from the catfish are identical.

I have named this Trematode *Acanthopsolus lageniformis* from its flask-like form. The most important differences from *Acanthopsolus oculatus* (Levins), the only hitherto-known member of the genus, consist in the position of the testes which are symmetrically placed one on each side of the body instead of obliquely as in *A. oculatus*, and in the presence of a receptaculum seminis which is said to be absent in *A. oculatus*. The eggs are enormous for the size of the worm, far larger in proportion than those of *A. oculatus*. These differences do not seem to justify the founding of a new genus for this worm, especially as the receptaculum seminis often appears to be absent when not full of sperms. I would, therefore, alter slightly the present diagnosis of the genus so as to make it include *A. lageniformis*:—Small distomes with delicate body rounded before and behind, which is divided into a very moveable flattened fore part and a plump hind part more circular in section. Skin very thin, armed with scales. Intestine with long prepharynx, pharynx of medium size, extremely short œsophagus. Fork of the intestine a little in front of the ventral sucker. Intestinal cœca similar, reaching to the hind end of the body. Excretory vesicle a simple sac. Genital pore median immediately in front of the ventral sucker. Male and female copulatory organs strongly developed, armed with thorn-like spines. Cirrus sac club-shaped, rather long, containing a bilobed seminal vesicle, an apparently weakly developed pars prostatica and a long cirrus covered with spines. Testes in the hind body, lying obliquely behind one another or symmetrically placed on each side of the body. Ovary on the right, in front of the testes or nearly at the side of the foremost testis. Laurer's canal present, receptaculum seminis present or absent. Vitellaria with big follicles, especially under the dorsal surface and at the sides of the body. Shell gland dorsal, at the side of the ovary. Uterus loops between the ventral sucker and genital glands. Eggs few in number, very big (about 0.125 mm. long) thin-walled. Inhabits intestines of marine fish.





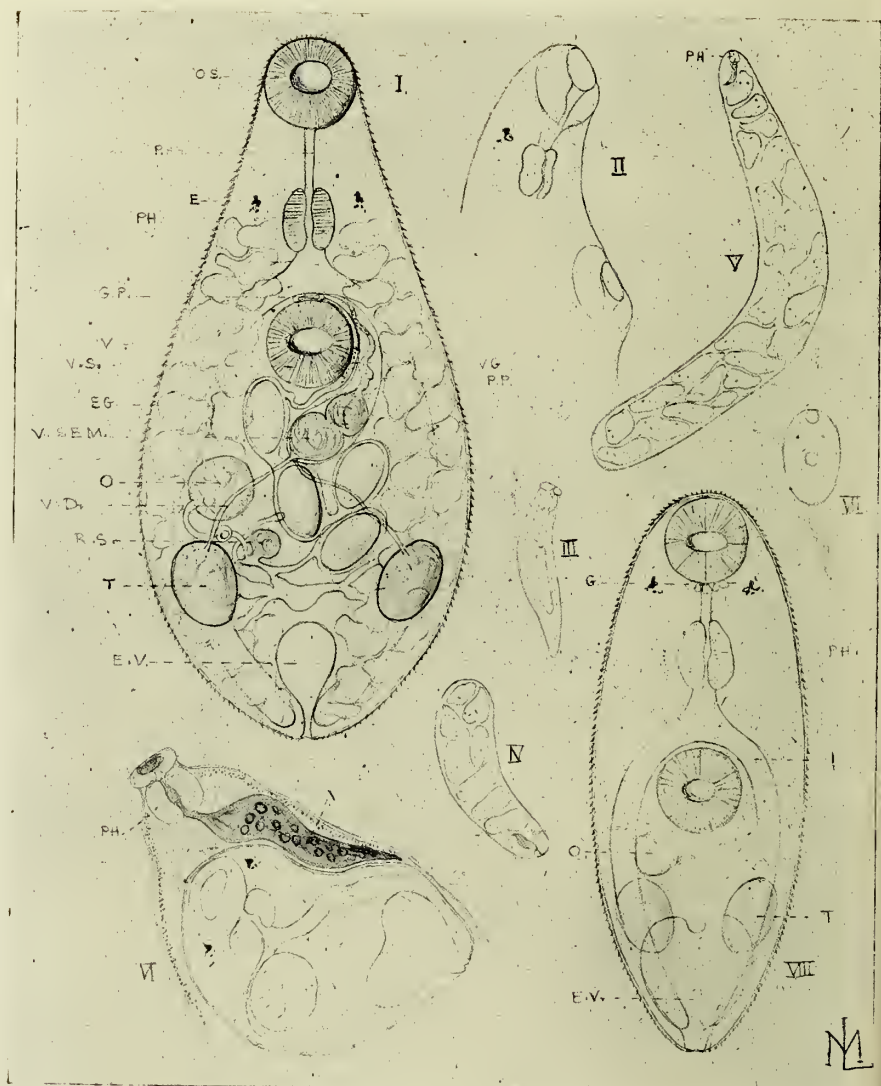


PLATE I.

The life history of *Acanthopsolus lageniformis* may be thus summed up :—

FIRST HOST.	INTERMEDIATE HOST.	FINAL HOST.
<i>Buccinum undatum</i> .	Omitted.	<i>Anarrhichas lupus</i> .
Inhabiting liver.		Inhabiting intestine.
(Rediæ containing cercariæ).		

### PLATE I.

FIG. 1.—*Acanthopsolus lageniformis* from intestine of Catfish—ventral view (natural size 0·80 mm.)

O.S.	...	Oral sucker.
P.PH.	...	Prepharynx.
E.	...	Eye.
PH.	...	Pharynx.
G.P.	...	Genital pore.
V.	...	Vitellaria.
V.SEM.	...	Vesicula seminalis.
P.P.	...	Pars prostatica.
V.S.	...	Ventral sucker.
O.	...	Ovary.
EG.	...	Egg.
V.D.	...	Vas deferens.
V.G.	...	Vagina.
R.S.	...	Receptaculum seminis.
T.	...	Testis.
E.V.	...	Excretory vesicle.

FIG. 2.—Side view of same.

- „ 3.—Young redia (natural size 0·30 mm.) from liver of *Buccinum undatum*.
- „ 4.—Small redia containing cercaria (natural size 0·50 mm.)
- „ 5.—Large redia containing cercaria (natural size 3·20 mm.)
- „ 6.—Anterior end of redia showing pharynx and intestine, and one contained cercaria (greatly enlarged).
- „ 7.—Cercaria with tail (natural size of body 0·50 mm.)
- „ 8.—Cercaria without tail (natural size 0·50 mm.); glands near oral sucker.

### LIST OF REFERENCES.

- 1.—NICOLL—"A Contribution towards a Knowledge of the Entozoa of British Marine Fishes," Part II. Ann. and Mag. Nat. Hist. (8) IV. (1909), p. 15.
- 2.—ODNER—"Die Trematoden des Arktischen Gebietes," p. 328 (1904).
- 3.—LEBOUR M. V.—"Notes on Northumbrian Trematodes," Northumberland Sea Fisheries Report for 1905, p. 6 (1906).

